

Abstract of the Disclosure

A flywheel energy storage system for preventing power interruptions to a load from interruptions of primary power includes a flywheel supported for rotation about an axis on a bearing system, and a motor-generator having a rotor coupled with the flywheel, and having a stator with multiple armature windings and a field coil. The field coil generates flux that passes through the armature windings as the rotor rotates to produce torque for accelerating the flywheel during charging, and produces electrical power from the flywheel during discharge. The armature windings are energized by a DC buss that is supplied by a rectifier connected to primary power. The flywheel system provides instantaneous full power capability along with output control for extracting more energy from the flywheel. The field coil is oversized and is powered in standby operation to produce an armature back emf that is at least 75% of the DC buss voltage. The current to the field coil remains substantially constant during a period including immediately before an interruption and immediately after and interruption of primary power. The flywheel system uniquely utilizes an extremely large field coil, which is preferably 25 –50% of the weight of the flywheel. The increased field coil size allows for both full standby energization without overheating and also reduces the armature reaction such that full power is available during a power interruption without requiring instantaneous increasing of the field coil current. In one embodiment, the field controller has a speed sensor for monitoring rotational speed of the flywheel and for varying electrical power to the field coil, without monitoring the primary power for interruptions. The field controller varies electrical current to the field coil approximately inverse linearly with the rotational speed of the flywheel during both standby and discharging operation to govern power to the field coil during standby operation such that the back emf of the armature remains substantially constant during an interruption of power.